

AN EDUCATIONAL AID

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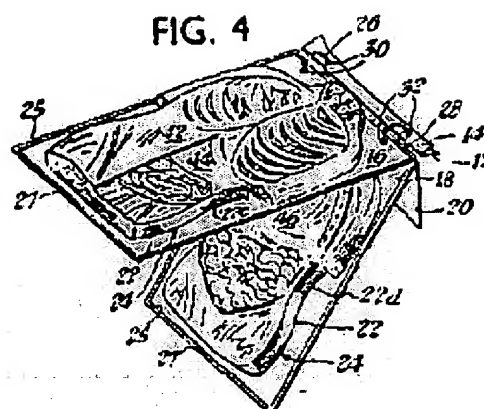
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Abstract of GB1250059

1,250,059. Educational appliances. ACADEMIC DIMENSION SYSTEMS Inc. 1 May, 1969 [1 May, 1968], No. 22281/69. Heading G5G. [Also in Division B6] An educational aid comprises a plurality of embossed leaves 14, 16, 18 with substantially identical contours 24 so that the leaves can be nested in a stack for storage or formed into a book. As shown, the leaves show the human body 42, 44, each leaf representing a different section to show the physical relationship among the organs or among the components of a given organ such as the heart. One or more of the leaves can be made of transparent material. Alternatively all the leaves may be transparent so that they may be stained or coloured to illustrate differing contours.



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PATENT SPECIFICATION

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DRAWINGS ATTACHED

1 250 059

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 (72) Inventor JOHN WILLIAM KNACK



(54) AN EDUCATIONAL AID

(71) I, ACADEMIC DIMENSION SYSTEMS, INC., a corporation organised under the laws of the state of Michigan, United States of America, of 30065 Greenfield Road, Southfield, Michigan 48075, United States of America, do hereby declare the invention for which I pray that a patent may be granted to me and the method by which it is to be performed to be particularly described in and by the following statement:—

The present invention relates to educational aids.

That a picture is worth a thousand words is an old adage having a great deal of truth. By the same token, a model or other three-dimensional representation is worth many two-dimensional pictures and many, many thousandths of words. This is particularly true in the educational field where teachers encounter serious problems in conveying ideas to children whose vocabularies and attention span are necessarily limited.

The present invention provides an educational aid comprising a plurality of leaves each including an embossed portion, the surface of which is shaped in conformance with a different non-planar section through a given structure, the embossed portion of one leaf being receivable by the embossed portion of another leaf and including alignment means so that the embossed portions may be orientated relative one another when the leaves are stacked in a predetermined manner.

Where the structure is the human body, a student, by comparing the three-dimensional representations on the leaves, can readily perceive the relationships among the various organs and other components of the body or the structures of the various organs. My aid facilitates this comparison and may be made from materials which are readily available, inexpensive and which can be made or moulded by the students themselves.

[Price 25p]

selves.

The leaves can be stacked in a way that is convenient for use and storage, the stacks requiring very little storage space. Each such nesting applies not only to the leaves of an individual stack or book, but to the nesting of a number of stacks or books to minimize storage requirements.

My educational aid obviates the necessity of supplying bulky models, frequently full-scale, for the classroom. Obviously such models are not only difficult to fabricate but frequently require specialized storage conditions in addition to considerable storage space. The ease with which my educational aid can be fabricated, moreover, permits the provision of an aid for each student in the classroom to facilitate explanation by the teacher. The use of both eyes and hands by students greatly enhances their attention-span.

The leaves of my educational aid may be made from materials which can be readily coloured or stained, or linked with coloured inks, such as afforded by the items conventionally known as ink markers. The leaves can be made so readily available that each student may possess an aid or stack and perform such colouring or staining as various components are explained by the teacher. A hand-and-eye rapport between each student and the teacher can be established which is far superior to a teacher's conventional explanation or demonstration of a single model or a single blackboard drawing or the like. Most importantly the direction of additional senses to the learning process prolongs the student's retention to a marked degree.

Educational aids according to the invention have the additional advantage, in comparison to use of conventional models, in that inter-relationships between circulatory systems, nerve systems, muscular-

ure, and other parts of the human body can be perceived easily by individual students simply by turning or withdrawing the leaves of a book or stack. Conventionally this can be accomplished only by provision of separate more or less complete models, by dissection of animals, or by the provision of a single model having complicated lighting systems and multiple layered construction. These approaches are far too complicated, particularly for use in elementary classrooms. Where such models are available it is difficult, especially in larger classrooms, for each student to make an adequate and detailed examination of the model.

In addition to the subjects mentioned herein and illustrated in the drawings, anatomical three-dimensional books or stacks can be readily devised, in accordance with the teachings of my invention, for illustrating the respiratory system, skeletal system, cross-sections of human muscles, bone and skin, sections of the human head, representations of the spinal column, including parts of the body and of the male and female reproductive systems. As noted above, educational aids in accordance with the invention are equally applicable to the representations of sectionalized views through complicated machinery and other devices or structures difficult to understand.

In order that the invention may be well understood there will now be described some embodiments thereof, given by way of example only, reference being had to the accompanying drawings wherein:

Figure 1 is a perspective view of my three-dimensional form having the embossed leaves thereof arranged in stack formation;

Figure 2 is a cross sectional view of the three-dimensional form as shown in Figure 1 and taken substantially along reference line II-II thereof;

Figure 3 is a view showing first and second pages of another arrangement of my three-dimensional form in book formation representing, in this example, the thoracic and abdominal regions of the human body;

Figure 4 is a similar view showing third and fourth pages of my novel book;

Figure 5 is a similar view showing a fifth page of the book;

Figure 6 is a perspective view of another arrangement of my novel three-dimensional form showing the use of an embossed, transparent overlay relative to an adjacent leaf of my book or stack formation;

Figure 7A is a perspective view of another form of my three-dimensional form representing the human heart and a section therethrough;

Figure 7B is a similar view partially

broken away showing the use of a transparent reference leaf;

Figure 8 is a perspective view of another three-dimensional form of my invention of transparent, stained, embossed leaves in stack formation; and

Figure 9 is a cross sectional view of the three-dimensional form of Figure 8.

Referring now more particularly to Figures 1 and 2 of the drawings, my novel three-dimensional form shown therein is arranged as a stack 2 of nested leaves 3, each of which is provided with an embossment of three-dimensional contour 4. The two-dimensional or perimetric contours 5 of the embossments 4 are substantially identical so that the leaves 3 can be readily nested to facilitate use and storage. The perimetric contours 5 are the respective junctions of the varied embossments 4 with flat portions 6 of the respective leaves 3. As the embossments 4 represent views along differing levels of or through a given structure, such as the human body the upper (as viewed in the drawings) leaves of the stack 2 are preferably more deeply embossed to ensure complete nesting of the leaves 3.

To further facilitate nesting, each corresponding perimetric contour 5 is slightly larger (in the plane of the flat portions 6 of the associated leaves 3) than its predecessor to allow for the thickness of the leaves 3, which desirably are formed as noted below, from thin, pliable sheet material.

The use of similar perimetric contours ensures proper orientation of the several embossments relative to one another and to the object, the several views of which are represented thereby. Errors in both stacking of the formed sheets and in their interpretation are obviated. The user of the nested forms is subjected to a self-checking procedure, with a minimum of effort on his part, notwithstanding the greater or smaller differences in the embossed portions 4 necessary to represent the several views of or through a given object.

If desired, each of the leaves 3 can be provided with a peripheral embossed ridge structure (not shown in Figure 1) spaced outwardly of the contour 4 thereon for stiffening of the planar portions of the leaves. The ridge structures of a given leaf if used can be made alignable with a ridge structure of other leaves for nesting purposes.

The three-dimensional information embossed upon the leaves 3 can be similar for example to that illustrated in Figures 3-5. Alternatively, contour and/or sectional views of some other structure, device or machine can be presented. The leaves 3 can be formed over suitable moulds, as

described below. When using the stacked, three-dimensional form 2, individual leaves 3 can be removed one at a time from the stack for comparison and other instructional purposes. The necessarily differing three-dimensional configuration within the similar perimetric contours of the embossment prevents the leaves from adhering when nested.

Referring now to Figures 3-5 of the drawings my novel three-dimensional form is arranged as a book 10 and comprises a plurality of pages or leaves 12, 14, 16, 18 and 20. A deeply embossed or three-dimensional representation 22 is formed upon each of the leaves 12-20 of the book 10. The respective perimetric contours 24 of the pages or leaves 12-20 are substantially identical and are similarly placed upon the associated leaves so that, when the book is closed, the contours 24 register to maintain the leaves in a particular array. The earlier pages of the book 10 can be more deeply embossed than later pages, as shown in the drawings, to ensure complete nesting of the later pages of the book 10, into preceding pages when the book is closed.

To facilitate opening and use of the book 10, the leaves 12-20 thereof desirably are loosely bound although other binding means can be used, as pointed out below. Suitable binding means, for example a pair of rings 26 and 28, are inserted respectively through alignable apertures 30, 32 in each page of the book 10. Other hinge means of course can be utilised, particularly in the illustrated example wherein the three-dimensional representation or embossments 22 are provided with rounded surfaces. The book 10 can be readily opened without an embossment 22 on one page binding against portions of an embossment upon an adjacent page, although the hinged edges 34 of the leaves 12-20 are maintained substantially contingent during opening of the book. In furtherance of this purpose, the embossments or three-dimensional contours 22 desirably are placed on the leaves 12-20 in alignment with the aforementioned hinge means.

Desirably, each page or leaf of the book 10 includes an embossed ridge structure 25 co-extending with the peripheral edges of the leaf or page and spaced outwardly of the perimetric contour 24. The ridge structure stiffens the planar areas of the page or sheet and extend outwardly of the contoured portion 22 thereof. Each of the leaves 12-20 also can be provided with a more deeply embossed "thumb" ridge 27 to facilitate paging the book 10. The loosely stacked forms mentioned in connection with Figures 1 and 8 and other figures can be similarly constructed, if

desired. Desirably, the ridge structures are alignable to facilitate nesting of the leaves as when closed in book form or stacked.

Each of the leaves 12-20 of my novel book can be fabricated from a white opaque plastic material, suitable for colouring, staining or inking by the student by any suitable means. Papier maché, paper, paper impregnated with plastic, aluminium foil, and coloured plastic sheets can also be used. It is also contemplated that all of the leaves can be made from a transparent plastic sheet and coloured with transparent coloured lacquers or the like as shown in Figure 7. I further provide a combination of opaque and transparent embossed leaves of my novel, three-dimensional form, such as illustrated in Figure 5 and suitably coloured with appropriate materials.

Using a suitably shaped mould having the contour of the embossment 22 of a given one of the leaves 12-20, a sheet of plastic or the like from which such leaf is fabricated is formed over the rigid mould by a suitable forming machine. Several such machines are available on the market, such as Dymo Form 4000 available from Dymo Industries, Inc., Berkeley, California 94701. Male and female moulding devices also can be used. The mould can be fabricated from modelling clay or other suitable material which is easily formed. Duplicate moulds can be made by pouring liquid Plaster of Paris or other setttable material into a plastic form which previously has been formed over the mould structure.

In the illustrated arrangement of Figures 1-5 the left half 34 of the embossed section 22a thereof shows the outer or surface contour of the thoracic and abdominal regions of the human body while the right half 36 of the embossment 22a is a contoured representation of the outer musculature of similar anatomical areas.

The second leaf 14 of the book 10 devotes the left half 38 of the associated embossment 22b to the rib structure of the human body and associated inner musculature. For purposes of comparison the right hand portion 40 of the embossment 22b repeats the outer muscular structure represented by contour 36 of embossment 22b of the first leaf 12.

On embossment 22c of the third leaf 16, the left hand contour 42 again repeats the contour portion 38 of the preceding page for purposes of comparison with right hand contour 44 showing the rib cage in greater detail, greater omentum cross section, part of the intestines and descending colon, urinary bladder; thyroid gland and cartilage, trachea, etc. Sections through the upper arm and pelvic areas show veins, arteries, and innermost muscles.

The embossment 22d of the fourth leaf 18 of my book illustrates a full section 46 through the thoracic and abdominal regions of the human body, wherein the muscles, ribs and greater omentum are removed. The contour 22d therefor is an anatomical section showing the relative location of the organs of the body directly under the greater omentum. Contour 22d, therefore, depicts three-dimensional shapes of the lungs, heart or pericardial sac, right and left lobes of the liver, stomach, small intestine, ascending, transverse and descending colon, veins and arteries, etc.

Embossment 22e of the final leaf 20, in this example, illustrates a contoured cross-section 48 through the lungs and removal of the small intestines, stomach, and a major proportion of the colon. Contour 22e, therefore, depicts a three-dimensional array, an anatomical section showing the liver, heart, pulmonary veins and arteries, superior vena cava, diaphragm, kidneys, suprarenal glands, pancreas, spleen, duodenum, ureter, descending colon, sigmoid, colon, common iliac veins and arteries, etc.

The variations in height also serve to demonstrate the size and spatial disposition of the various organs of the body relative to one another and to the skeletal, musculature, and the circulatory systems of the body. It will also be evident as viewed in Figures 3-5 of the drawings that the student can compare either the cameo surfaces of adjacent leaves to ascertain the structure of the human body or other items represented by the book, or alternatively he can compare the cameo surface of one leaf with the intaglio surface 22' of a preceding leaf. A little practice may be required for the latter means of comparison.

It will be seen from the foregoing that the embossments 22a-22e or book leaves 12-20 become shallower to ensure complete nesting of the shallower later leaves into the deeper initial or earlier leaves, when the book 10 is closed.

Referring now to Figure 6 of the drawings, means are provided for facilitating further the students ability to compare the various leaves of my three-dimensional form. One arrangement of such means includes the provision of a transparent leaf 50 having an embossment 22' similar in perimetric contour 24' to that of the remaining leaves of the book or stack 10'. The transparent leaf 50 in this example is inserted between leaves 18' and 20' of the form 10'. The form 10' otherwise is constructed in a manner similar to that illustrated in Figures 1 and 2 or 3-5. In this example embossment 22' of the leaf 50 is provided with a contour 52, which is substantially similar to the contour 46' of

preceding leaf 18'.

With the arrangement of Figure 6 a student, by opening the book or stack 10' between leaf 18' and transparent leaf 50 provides the succeeding leaf 20' of the book or stack with a transparent overlay. The overlay leaf 50 can be paged or removed from the leaf 20' for purposes of applying colouring to the various components of contour 48' of the leaf 20'. However, with the transparent leaf 50 in the position shown, the spatial positions and sizes of the forward organs of the thoracic and abdominal regions of the human body are readily perceived with respect to the positions of the rearward organs represented on opaque leaf 20'. These relative positions can be made even more striking to the student by the application of differing colours or stains to the various organs. It is contemplated that such application of colouring will be made by individual students, each possessing a book or stack such as the form 10', during demonstration by a teacher using anatomical charts, a similar three-dimensional form, or other demonstration means.

Referring now to Figure 7A of the drawings, the exemplary form of my three-dimensional teaching aid shown therein is arranged as a book 54 for delineating the outer contour of an organ of the body relative to one or more sections through the organ. In this example, the book 54 includes leaves 56 and 58 assembled with a single binding ring 59 and each having embossed portions 60 and 62 respectively. Each of the embossed portions has a substantially similar perimetric contour 64 so that the leaves can be nested as described previously. Contour 60 of the leaf 56 shows, for example, the outer configuration of a human heart together with sections of the aorta and arteries. Contour 62 of leaf 58 on the other hand shows a section through the heart and exposing cut-away portions of the left and right auricles, left and right ventricles, and associated arteries.

The relationship between the exterior and interior of the human heart can readily be seen by turning the first leaf on page 56 or by comparing the intaglio side 66 of the first page or leaf 56 with the cameo side 62 of the leaf 58. Comparison can be facilitated still further by alternative provision of a transparent overlay leaf 68 having a similar contour 60' relative to the first page or outer leaf 58, as better shown in Figure 7B. As stated in connection with Figure 6 of the drawings, the transparent colouring materials can be applied to the transparent leaf 68 to facilitate comparison still further. It is likewise contemplated that the opaque surfaces of leaves 56, 58 of the book 54 like-

wise can have various colours applied thereto.

In Figures 8 and 9 of the drawings all of leaves 70, with an alternative exception 5 of lowermost leaf 71, of stack 72 are embossed from transparent plastic sheet material or the like. Each of the leaves 70 can be stained or lacquered a different colour or combination of colours to distinguish the contour thereof from the contours of adjacent transparent leaves in the stack. The various levels of contours or sections 74 of the leaves 70, then, can readily be perceived by the student. In 15 furtherance of this purpose, it is contemplated that lower leaves of the stack 72 can be coloured with deeper hues or that the bottommost leaf 70a can be fabricated from an opaque material to enhance the students perception. In any event, the perimetric contours 76 are substantially identical to facilitate nesting of the embossments 74 to assemble the stack 72.

It is contemplated that the leaves 70 25 of the stack 72 can be permanently secured in nested formation or can be stacked loosely, as set forth in Figures 1 and 2, so that individual leaves 70 can be removed for closer study. In furtherance of the last-mentioned purpose, the leaves 70 can be assembled in a three-dimensional book arrangement, if desired, after the manner of Figures 3-5 or 7.

From the foregoing it will be apparent 35 that novel and efficient forms of three-dimensional books have been disclosed herein. While I have shown and described certain presently preferred embodiments of the invention and have illustrated presently 40 preferred methods of practicing the same, it is to be distinctly understood that the invention is not limited thereto but may be variously embodied and practiced within the scope of the following claims.

Although the above described aids have 45 been described with respect to portions of the human body, it will be apparent that my educational aids (whether in stack or book form) can be utilized for other purposes. For example the forms can be employed to demonstrate relationship between 50 sub-circuits of a complicated electric circuit or for showing the inter relationships of components of various sections through 55 a motor or other relatively complicated machine.

WHAT I CLAIM IS:—

1. An educational aid comprising a plurality of leaves each including an embossed portion, the surface of which is 60 shaped in conformance with a different nonplanar section through a given structure, the embossed portion of one leaf being receivable by the embossed portion of another leaf and including alignment 65 means so that the embossed portions may be orientated relative one another when the leaves are stacked in a predetermined manner.

2. An aid according to claim 1, wherein 70 the outer peripheries of the embossed portions form the alignment means.

3. An aid according to claim 1 or 2 wherein the leaves are secured together in the form of a book. 75

4. An aid according to claim 2, wherein the leaves are secured together in the form of a loose leaf.

5. An aid according to any preceding claim wherein the embossed portion of an 80 upper leaf in the stack is in higher relief than the embossed portion of a lower leaf so that the embossed portion of the lower leaf can be entirely nested within the embossed portion of the upper leaf. 85

6. An aid according to any preceding claim wherein each leaf has a planar peripheral portion surrounding the shaped portion.

7. An aid according to any preceding 90 claim wherein each leaf has a peripheral ridge giving it rigidity.

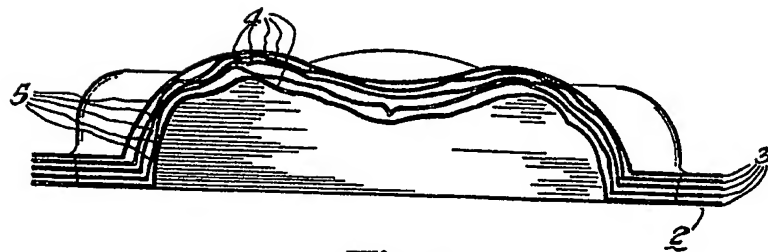
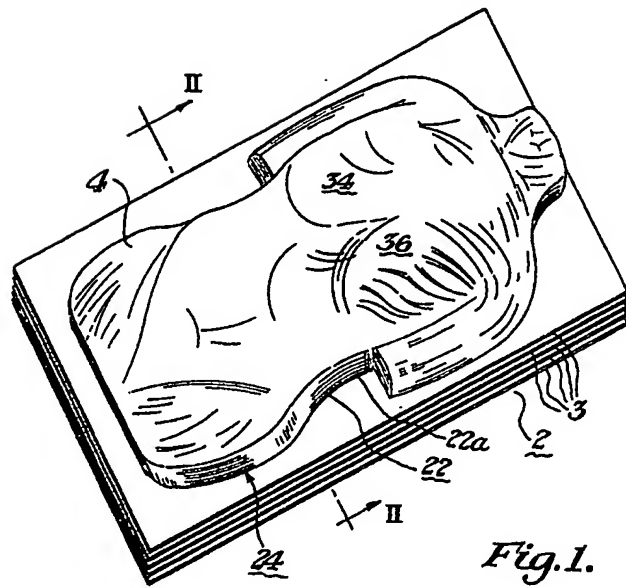
8. An aid according to any preceding claim wherein at least one of the leaves is transparent. 95

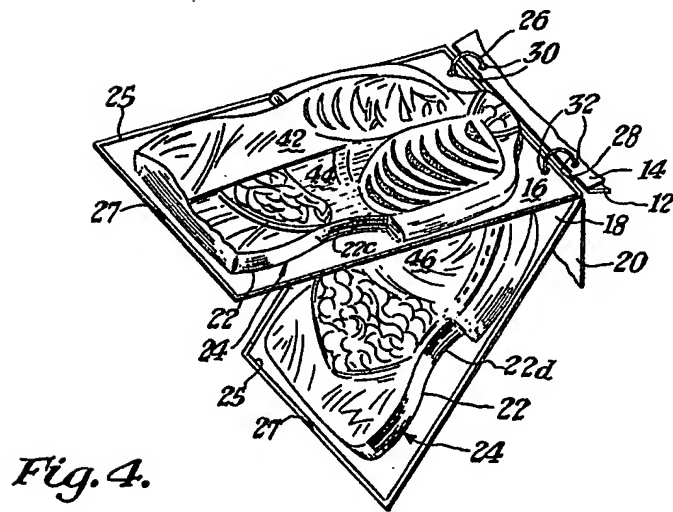
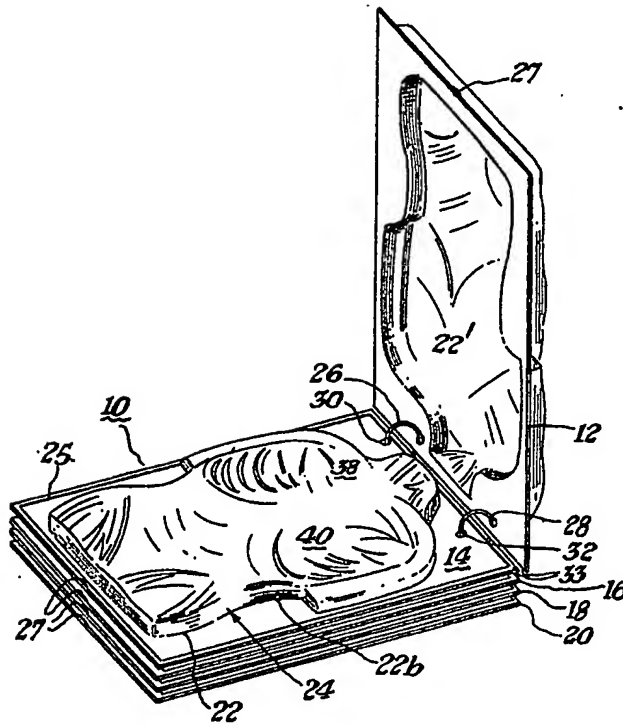
9. An aid according to claim 8, wherein all the leaves are transparent and are stained or coloured to illustrate differing contours of and/or sections through the said structure. 100

10. An aid according to any preceding claim wherein the leaves are made of pliable sheet material.

11. An aid substantially as herein described with reference to the accompanying 105 drawings.

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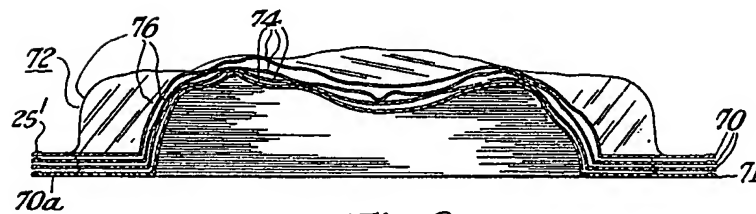
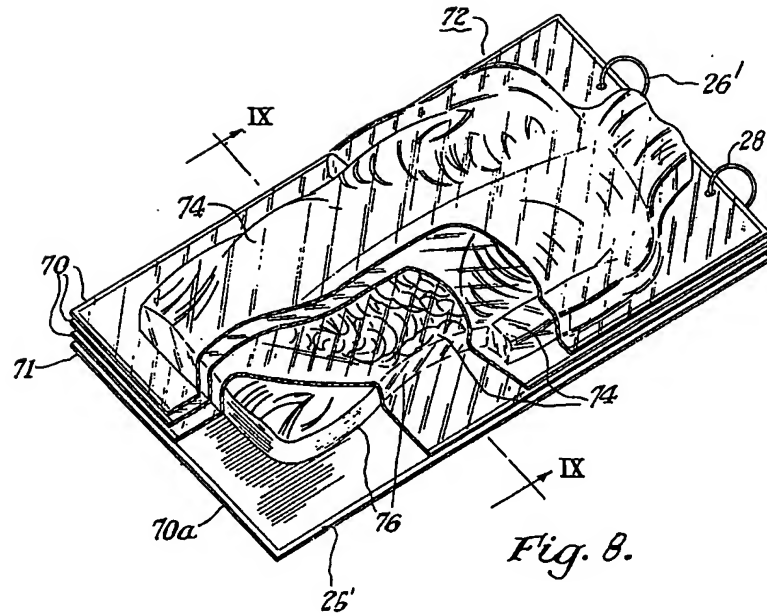
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COMPLETE SPECIFICATION

5 SHEETS

This drawing is a reproduction of
the Original on a reduced scale.

SHEET 5



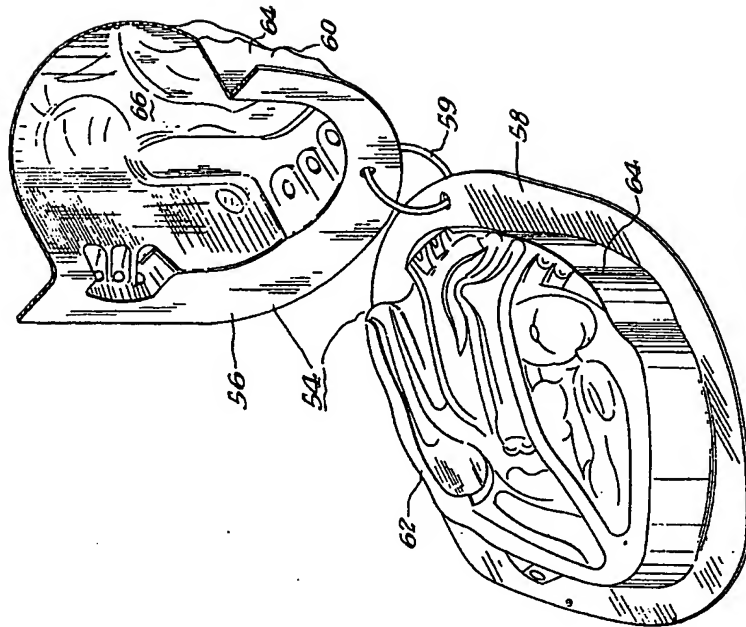


Fig. 7A.

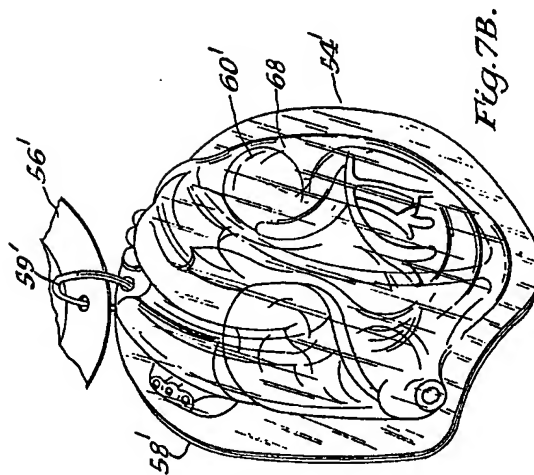


Fig. 7B.

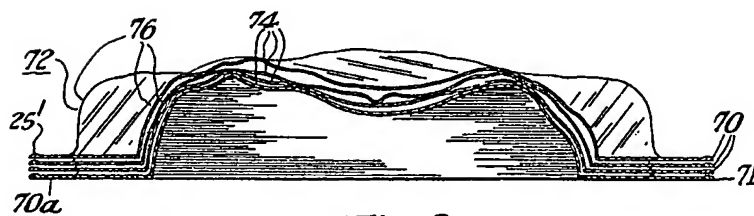
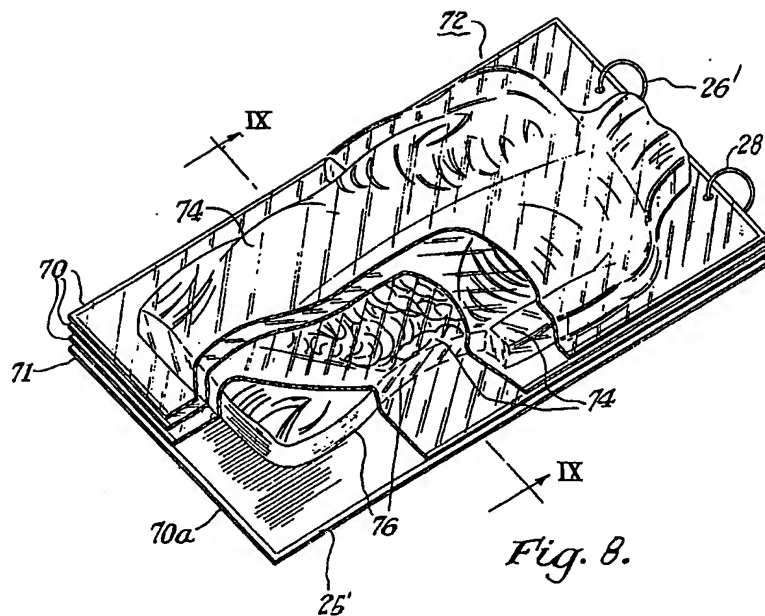


Fig. 9.